



NATURAL RESOURCES DEFENSE COUNCIL

Suggested Modifications to the Residential Lighting Section of Title 24

Prepared by Noah Horowitz
Senior Scientist
Natural Resources Defense Council
nhorowitz@nrdc.org

May 17, 2006

Description – The current version of Title 24 provides various compliance options for meeting the residential lighting requirements. These requirements vary by room type and may include a choice of one or more of the following: energy efficient fixture, manual on/automatic off sensor, or a dimmer. This proposal would remove the dimming option from the current compliance options for bedrooms, and hallways. The lighting requirements for the other rooms would remain unchanged.

Type of Change

We are recommending a change to the compliance options contained in Section 150 (k).

Shown below in italics are the current lighting requirements that apply to many rooms in the house including dining rooms, living room, bedroom, entry way and hallway. In brief, it allows the builder to select one of the following:

- High efficacy luminaire (pin based energy efficient fixture)
- Occupancy sensor (manual on/automatic off control)
- Dimmer switch

4. Lighting other than in Kitchens, Bathrooms, Garages, Laundry Rooms, and Utility Rooms. Permanently installed luminaires located other than in kitchens, bathrooms, garages, laundry rooms, and utility rooms shall be high efficacy luminaires.

EXCEPTION 1 to Section 150 (k) 4: Permanently installed luminaires that are not high efficacy luminaires shall be allowed provided they are controlled by a dimmer switch.

EXCEPTION 2 to Section 150 (k) 4: Permanently installed luminaires that are not high efficacy shall be allowed provided that they are controlled by an occupant sensor(s) certified to comply with Section 119 (d). Such motion sensors shall not have a control that allows the luminaire to be turned on automatically or that has an override allowing the luminaire to be always on.

NOTE: Lighting in areas adjacent to the kitchen, including but not limited to dining and nook areas, are considered kitchen lighting if they are not separately switched from kitchen lighting.

Given the much lower cost of a dimmer switch compared to the other two compliance options, we believe builders will most frequently choose dimmers for these room types. NRDC is concerned about the use of dimmers because: a) we are not aware of any studies that show dimmers will result in meaningful energy savings for these room types, and b) the use of dimmers with screw based fixtures may result in consumers having a bad experience with CFLs that are not intended to be used in dimming circuits. As screw based CFLs represent one of the single largest sources of energy savings in the state, we don't want to do anything to harm their reputation and future sales. (Note,

while dimmable CFLs are available on the market, most consumers simply put the lower cost non-dimmable CFL into dimmable circuits).

For the above two reasons, we think the CEC should stick with compliance options that will result in significant savings. **As such, we recommend the dimming option be removed for the bedrooms and hallways.** For both these room categories a wide range of cost effective, attractive high efficacy fixtures are available. In addition, the builder can continue to select the occupancy sensor if they prefer.

In recognition of the higher levels of lighting design that are sometimes employed in some of the other room types and to preserve maximum flexibility, we deliberately chose not to remove the dimming compliance option from the code for the other room types – dining room, main entrance, and living room. This was in part due to the infancy of the hi efficacy luminaire market for highly decorative chandeliers, etc. We also acknowledge that dining rooms (and kitchens) are one of the few rooms where dimming is used with some regularity and results in actual energy savings.

Energy Benefits

For the bedrooms and hallways, we believe the user rarely dims the hardwired fixtures. As such, this compliance option will not yield significant savings. As stated in the above section, we recommend limiting the compliance options for these two room types to high efficacy fixtures or the occupancy sensor.

For the bedroom, one can assume a base case ceiling fixture with two sockets, each containing a 75W lamp. A high efficacy fixture with equivalent light output would use two 18W lamps. This translates to a 114W per bedroom energy savings. The table below shows the energy (kWh) and electric bills savings that would occur for each bedroom assuming a 10 year horizon, 14 cents/kWh, and various hours of use.

	2 hours/day	3 hours/day	4 hours/day
Energy savings (kWh/yr)	85	127	170
10 year energy savings (kWh/yr)	\$11.9	\$17.8	\$23.8
10 year electric bill savings (\$)	\$119	\$178	\$238

Per the above, the energy savings that the more efficient fixture provides will dwarf the incremental cost of the more efficient fixture. Even greater savings would be achieved for those bedrooms where the builder installs a ceiling fan with a light kit as these frequently come with 3 to 5 screw-based sockets and a load ranging from 135 to 300 W. Numerous light kits are on the market that use a central efficient light source or come with pin based sockets that accept efficient pin based CFLs.

A similar analysis for hallway fixtures would show hi efficacy fixtures to be cost effective compared to the base case incandescent or similar fixtures that are typically used.

If the user chooses instead to install a motion sensor, this will likely provide somewhat lower energy and economic savings to the user. These would still however dwarf the savings a dimmer might provide in these rooms. Due to time constraints the author did not have time to access the assumptions used by the CEC to calculate the % savings provided by occupancy sensors.

Non-energy Benefits

The proposed code change would result in less frequent lamp changes. The lamps in the high efficacy luminaires will last roughly 5 to >10 times longer than those using less efficient technologies. The occupancy sensor will also help extend lamp life.

Environmental Impact

None that we are aware of.

Technology Measures

Measure availability and cost – the prior proceeding collected information on the purchase cost of the various lighting options – non hi-efficacy luminaire, hi efficacy luminaire, occupancy sensor, and dimmers. Since then, the availability and selection of hi-efficacy fixtures has increased dramatically.

Useful Life, Persistence, and Maintenance – these issues have been previous addressed in prior proceeding.

Performance Verification

No changes from prior code.

Cost Effectiveness

See energy benefits section that shows this measure to be cost effective from a preliminary assessment. We are prepared to work with the CEC and other interested parties to perform a more rigorous cost effectiveness analysis.

Analysis Tools

To better asses this proposal additional user data could be beneficial in the following areas:

a) residential dimmer user behavior – what percent of the time do they use the dimmer? Convert this information to annual energy savings for key fixtures and rooms.

b) market update on fixture availability and cost – Based on the growth of ENERGY STAR qualified fixtures, we believe sufficient info is available regarding product availability. Informal surveys of lighting distributors and retailers could provide updated pricing information.